CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

SECRET

25X1 [redacted]

COUNTRY	USSR (Kalinin Oblast)	REPORT NO.	[redacted] 25X1
SUBJECT	Research and Development Activities on Rocket Fuels and Test Apparatus at Branch No. 1 of NII-88, Gorodomlya Is.	DATE DISTR.	20 August 1953 25X1
		NO. OF PAGES	47
25X1 DATE OF INFO.	[redacted]	REQUIREMENT NO.	[redacted]
PLACE ACQUIRED	[redacted]	REFERENCES	[redacted]

25X1

[redacted]

INTRODUCTION

1. [redacted] at Gema [redacted] was a Naval Ordnance Research Group, headed by Ing. Mummert, a submarine torpedo specialist who was formerly with the Walther plant at Kiel. 25X1

25X1

2. [redacted] 25X1

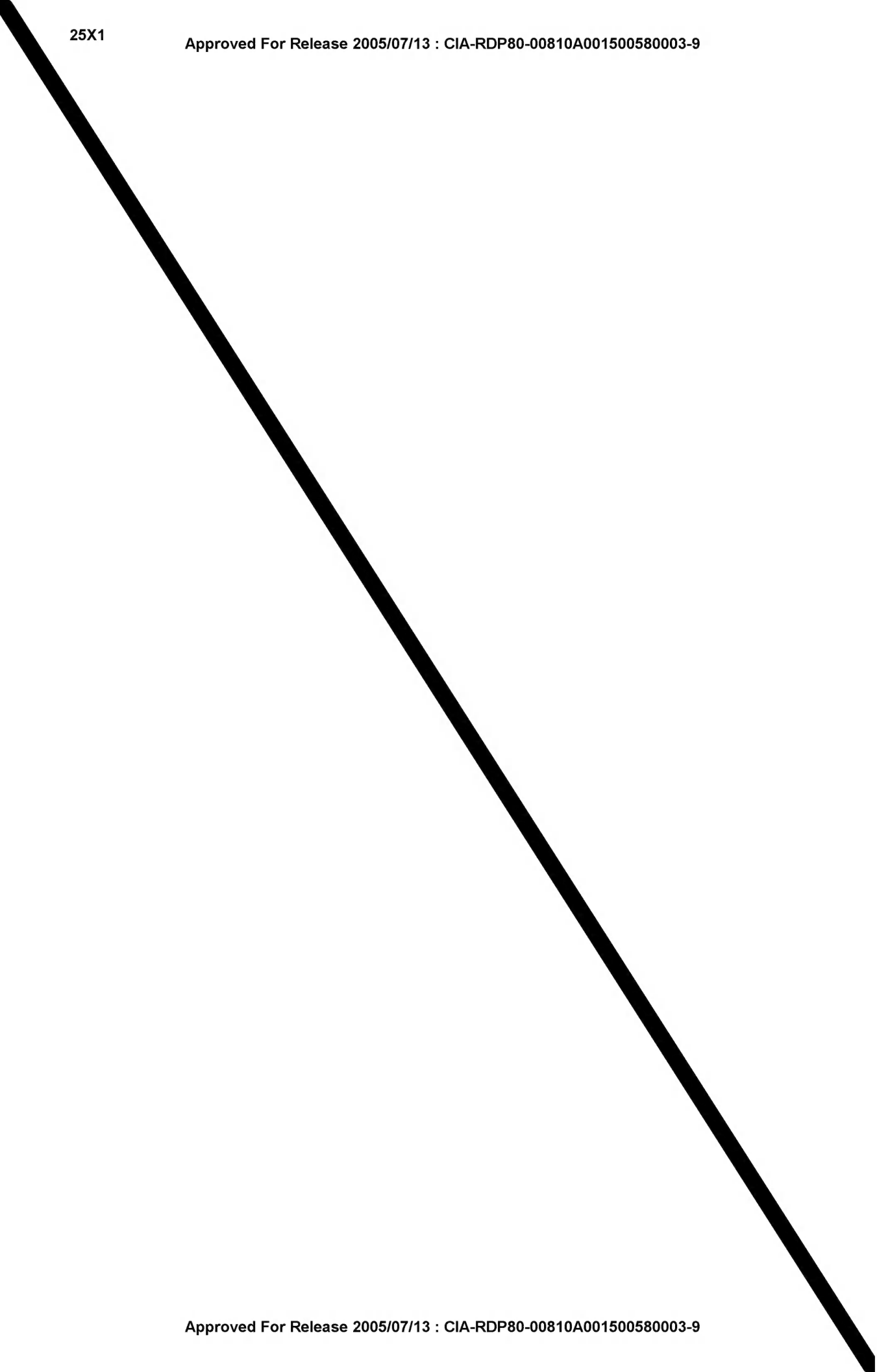
SECRET

(classification)

STATE	#x	ARMY	#x	NAVY	#x	AIR	Ev	#x	FBI		AEC		ATIC	Ev	x	OSI	Ev	x

(Note: Washington Distribution Indicated By "X"; Field Distribution By #.)

25X1 [redacted]



25X1

25X1

25X1

OSTASHKOV

3. Ostashkov at that time had no organization, laboratories, or working space. Facilities consisted of an old school building and clinic, and was furnished only with restaurant tables and chairs. No technical equipment was available, except for that which belonged to the individuals personally. The Soviet scientific director, Bosh-Kotsyubinskiy, was a young man who had just graduated from school.

4. Because of the total lack of guidance, the German specialists grouped themselves together, usually with other members of the organization from which they had been deported, and assigned themselves some type of "paperwork project". The purpose of this was two-fold: (1) to pass the time until laboratory facilities could be completed; and (2) to establish some sort of a collective technical library where they could refer to problems concerning rocket development with which they might not be completely familiar. 25X1 texts 25X1 are as follows:

a. Temperature measuring methods. A basic paper to be used in the library and stressing methods as related to rocket test and stand procedure, i.e., measurement of inside and outside wall temperatures, gas temperatures, etc.

b. Plans for a fuel laboratory.

c. Theoretical calculation of the magnitude of the time of hypergolic ignition lag, stressing how it develops, and how it may be calculated. 25X1 25X1

d. A study of the use of gas pressure as a prime mover for rocket fuels and the effect of absorbed gas on the fuel's performance. This was primarily as adapted to anti-aircraft type missiles. No further work was done along these lines.

e. Calculations governing the relationship between the length of time fuels remained in the combustion chamber and the amount of thrust received from them. 25X1 25X1 25X1 The Germans at Peenemuende had had certain Normal Times that they used in design problems. 25X1 they were not accurate enough 25X1 25X1 25X1

f. Mathematical relation between thrust and the distance between the shock diamonds formed in the exhaust stream.

25X1
25X1

8. Design of a rocket fuse. This was a time-consuming project that was a carry-over from activities at Gema. [redacted] 25X1

25X1 [redacted] It was not to employ either radar or electronics, and was to detonate the missile a short distance above the ground. The task was never completed.

5. [redacted] 25X1

25X1 Prof. Wilhelm SCHUETZ, a physicist in Sector 4 [redacted] 25X1

25X1

6. [redacted]

7. [redacted] 25X1

Ing. Helmut GROETTRUP, the German engineer whom the Soviets had appointed chief of the German specialists group.

[redacted]

25X1 [redacted]

8. [redacted]

25X1

9. [redacted]

10. [redacted]

737-8097

Next 2 Page(s) In Document Exempt

Approved For Release 2005/07/13 : CIA-RDP80-00810A001500580003-9

25X1
25X1

26.

27.

DESIGN OF SCHURRE

28. The object of this undertaking was to determine the optimum geometrical form for an exhaust flame deflector so that: (a) in launching a missile the flame could be deviated 90° evenly and throughout all 360° of a circle; and (b) so that the design could utilize normal Russian steel (Soviet designation #17). The forms used at Peenemuende were not adequate. They gave uneven flame distribution and sometimes caused the missile to tilt, the point of the schurre continually burned off, etc.

25X1

25X1

29. The first designs were studied with the aid of the two-kilogram test stand, but were later repeated with the 20-kg. unit. Upon Soviet request, all experiments were conducted on actual metal models with work supported by photographs, rather than working with mathematical designs.

25X1

HEAT TRANSFER STUDIES

30. In this specific instance, the two-kilogram stand was used primarily as a source of heat energy for heat transfer studies. Average temperature of the flame used was about 2000°C. First measurements were made on one-millimeter-thick sheets of normal Soviet steel #17, steel #13, and aluminum alloy AMG 35. In these studies, the flame was allowed to impinge upon the metal with an angle varying from 90° through 0°.

25X1
25X1

31.

32.

33. Following the experiments with plywood, samples of glass wool of Russian origin were received for testing. Drs. MATTHES and OTTO made test panels from this material according to Soviet specifications, wherein the glass wool was compressed into a sheet one centimeter thick, and held between two 0.1 mm. veneer sheets of walnut. Bonding between the glass wool and the wood was waterglass in the first sample, and aircraft glue (Fliergerleim) of Russian origin in the second. The bonding force used was 20 kg. per square decimeter.

25X1

34. Burning and heat transfer tests were also conducted on these panels through angles varying from 90° to 0°, as with the plywood sheets. The walnut veneer burned away very quickly, but the wool itself remained intact. Insulating qualities of these sheets were very good, and the paneling made with aircraft glue withstood the test better that the other. No further tests were conducted with glass products of any kind

25X1

These panels were also proposed by the Soviets for missile heads.

OXYGEN-ALCOHOL FUEL RATIO

35. Prior to this time, Dr. Heino ZEISE had conducted theoretical computations as to the thrust values possible with various alcohol-oxygen ratios, using a range of chamber pressures from six atmospheres to 16 atmospheres.

25X1

25X1

25X1
25X1

[redacted]

36. ZEISE had previously compiled volumes of tables to be used in the design of rocket motors, a work requiring four years, all of which were proved wrong.

25X1 [redacted]

LABORATORY TEST STANDS

37. By the end of December 1948, a new two-kilogram, and the 20-kg. test stands were completed and ready for operation. The entire unit was designed and built in Ostashkov, except for the compressor, which was taken from an old refrigeration unit. All the work done on the stand was done by Germans [redacted] 25X1 The electric valves and gauges necessary for its operation came from Peenemuende.

38. First experiments began in January 1949, and again, all orders for tests to be conducted came from the Soviet chief engineer KURGANOV, with one exception, an order from a Soviet civilian, [redacted] 25X1
25X1 [redacted] concerning the study of the ionization of the exhaust flame.

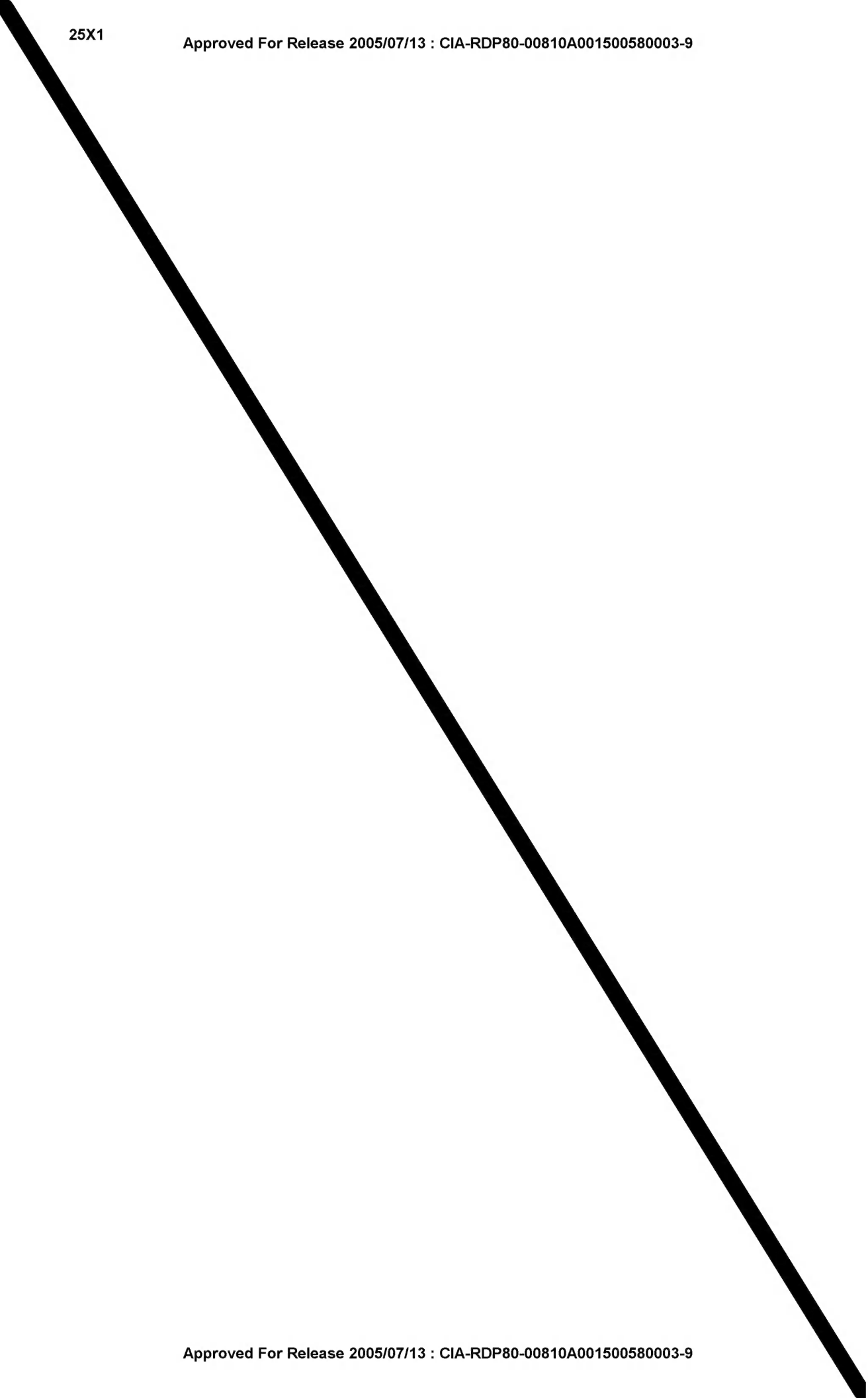
FUEL IGNITION PROBLEM, TWO-KILOGRAM STAND

39. The Germans at Peenemuende, prior to 1943, had had difficulties with the initial ignition of the oxygen-alcohol fuel combination and several explosions had resulted. They had solved the problem sufficiently well, but the Soviets continued to have difficulty, not only with oxygen-alcohol, but also with oxygen-kerosene fuels. [redacted] 25X1
25X1 [redacted] this was because they worked with a much higher injection pressure than the Germans, yet did not alter the rocket motor. The task, therefore, was to find the best method of igniting fuel mixtures, especially the oxygen-kerosene combination. Problems which had to be resolved for this fuel were:

a. Which to inject first.
b. How much time to allow between the injection of one component and the other. 25X1
c. The pressures to be used in the start.

40. [redacted]

41.



20 Kg. TEST STAND

45. Following is a list of the experiments conducted with the use of the 20 kg. test stand:

a. Repetition of the determination of the optimum mixing proportion for the 75 per cent alcohol-liquid oxygen fuel at chamber pressures varying from 8 to 22 atmospheres.

b. Similar determinations with 80 per cent alcohol and within the same chamber pressure range.

c. Measurement of gas temperatures inside and outside of chamber when fueled with 75 per cent alcohol.

d. Spectroscopic determinations of gas composition inside and outside of the chamber.

e. Repetition of the "Schurre" study.

f. Experiments with the coloring of the exhaust flame using sodium and lithium salts (for gas density studies).

g. Ionization measurements of the exhaust.

46. An optical pyrometer using a tungsten element was used to measure the gas temperature both inside and outside of the chamber. The purpose of this test was to determine the highest temperature encountered for comparison with Dr. ZEISE's previously mentioned calculations. Temperatures were taken for various alcohol mixtures and at various chamber pressures.

47. Professor FROST, a famous physical chemist and well-known member of the Soviet Academy of Sciences and a Stalin prize winner, proposed the theory that a re-combination of gases, previously dissassociated in the combustion chamber of a rocket motor, occurred in the laval section of the motor, thereby restoring lost energy to the flame.

25X1 [redacted]

48. Vasilyev [redacted], director of Plant 88 and successor to General GONOR, supported this theory, while KURGANOV, who had previously been Soviet chief engineer at Ostashkov and who had been transferred to Plant 88, refused to accept the thesis.

25X1 [redacted]

25X1

49. [redacted]

25X1 [redacted]

Next 35 Page(s) In Document Exempt